

## **Field studies of wind erosion intensity and its variability under different vegetated sandy grasslands, Inner Mongolia**

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### **Abstract**

Field measurements were made with sand samplers during the two wind storms to investigate aeolian intensity and its variability for the mobile, semi-mobile, semi-fixed and fixed sand lands with different vegetation conditions.

The results showed a considerable difference in the intensity of wind erosion among the four sand lands for both measurements. On the May 15 measurement, the total windblown sand transport rate within the 20 cm height above the surface was  $83.1 \text{ g cm}^{-2} \text{ h}^{-1}$  in the mobile dune, being 2.1-fold, 9.2-fold and 33.9-fold higher than the semi-mobile, semi-fixed and fixed sand lands. On the May 17 measurement, the total windblown sand transport rate was  $105.7 \text{ g cm}^{-2} \text{ h}^{-1}$  in the mobile dune, being 5.6-fold, 14.1-fold and 75.6-fold higher compared to the semi-mobile, semi-fixed and fixed sand lands. This difference was primarily attributed to contrasting surface properties of the four sand lands. Of the measured surface properties, surface roughness length and vegetation cover were much more closely related to the total windblown sand transport rate (accounting for 67% and 59% of the variation in this variable, respectively) than any other surface properties such as canopy height and soil hardness. This suggests that surface roughness length and vegetation cover are the most important factors affecting the wind erosion intensity. No linear or curvilinear relationship was found between surface soil water content and the total sand transport rate or sand flux rates at individual heights, probably due to small variability in surface soil water content among the four sand lands during the measurements.

Surface roughness length of the sand land is mainly governed by the cover of vegetation accounting for 78% of the variation in this variable. Soil hardness was the next dominant component of surface roughness length, accounting for almost 50% of the variation in surface roughness length. A multivariate predictive equation, developed by regressing the surface roughness length on vegetation cover and soil hardness is applicable to the exploration of the combined effect of vegetation cover and soil hardness on surface roughness, because the predicted values matched those from field measurements reasonably well, with an  $R^2$  value of 0.88.